

In the Claims

Please amend claims 49-66 as indicated among the following clean versions of the unamended claims:

Claim 1. (Original) A method for oxidizing a fuel, comprising:

providing a catalyst mixture including at least one compound having at least one element selected from the group consisting of group III and group IIA, and at least one compound having at least one element selected from the group consisting of group IA, group IVA, group VI, group VII, group VIII, group IB, group IIB and combinations thereof;
mixing a portion of the catalyst mixture with combustion air prior to mixing the catalyst mixture with a fuel to be oxidized; and
oxidizing the fuel.

Claim 2. (Original) The method of claim 1, further comprising adding a liquid to the catalyst mixture before mixing it with the combustion air.

Claim 3. (Original) The method of claim 2, wherein the liquid comprises one or more liquids from the group consisting of ethylene glycol and water.

Claim 4. (Original) The method of claim 3, wherein the liquid further comprises lithium chloride.

Claim 5. (Original) The method of claim 1, further comprising sparging a gas through the catalyst mixture to generate fluidized catalyst particles to mix with the combustion air.

Claim 6. (Original) The method of claim 5, further comprising ionizing the sparging gas prior to sparging it through the catalyst mixture.

Claim 7. (Original) The method of claim 5, wherein the sparging gas is selected from the group consisting of air, helium, nitrogen, argon, and combinations thereof.

Claim 8. (Original) The method of claim 1, wherein the compound having a group III element is selected from the group consisting of AlCl_3 and $\text{Al}(\text{NO}_3)_3$.

Claim 9. (Original) The method of claim 1, wherein the catalyst mixture comprises one or more of platinum, rhodium, rhenium, manganese, iron, aluminum, magnesium and molybdenum.

Claim 10. (Original) The method of claim 1, wherein oxidizing the fuel comprises oxidizing the fuel in an open flame.

Claim 11. (Original) The method of claim 1, wherein oxidizing the fuel comprises oxidizing the fuel in an enclosed flame.

Claim 12. (Original) The method of claim 1, wherein oxidizing the fuel comprises oxidizing gasoline.

Claim 13. (Original) The method of claim 1, wherein oxidizing the fuel comprises oxidizing diesel fuel.

Claim 14. (Original) The method of claim 1, wherein oxidizing the fuel comprises oxidizing a fuel selected from the group consisting of number 2 fuel oil, fuel oil refined from crude oil, diesel fuel, gasoline, compressed or liquified natural gas, gasohol, any hydrocarbon having one or more carbon atoms such as methane, ethane, propane, butane, isobutane, toluene, xylene, octane, benzene, mixtures of alcohols having methanol, ethanol, propanol, butanol, isopropanol, isobutanol, pentanol, hexanol, heptanol, octanol and combinations thereof, vegetable oil such as corn oil, mineral oil, coal, coal gas, asphalt vapor, oxidizable vapors from chemical processes, wood, paper and combinations thereof.

Claim 15. (Original) The method of claim 1, wherein oxidizing the fuel comprises oxidizing within a combustion chamber of a reciprocating engine selected from the group consisting of a gasoline fuel engine and a diesel fuel engine.

Claim 16. (Original) The method of claim 1, wherein oxidizing the fuel comprises oxidizing the fuel within a combustion chamber of a reciprocating engine, wherein the fuel is selected from the group consisting of number 2 fuel oil, fuel oil refined from crude oil, diesel fuel, gasoline, compressed or liquified natural gas, gasohol, any hydrocarbon having one or more carbon atoms such as methane, ethane, propane, butane, isobutane, toluene, xylene, octane, benzene, mixtures of alcohols having methanol, ethanol, propanol, butanol, isopropanol, isobutanol, pentanol, hexanol, heptanol, octanol and combinations thereof, vegetable oil such as corn oil, mineral oil, coal, coal gas, asphalt vapor, oxidizable vapors from chemical processes, wood, paper and combinations thereof.

Claim 17. (Original) The method of claim 1, wherein oxidizing the fuel comprises oxidizing within a flame zone of an appratus selected from the group consisting of a furnace, a boiler and an incinerator.

Claim 18. (Original) The method of claim 1, wherein oxidizing the fuel further comprises oxidizing within an apparatus selected from the group consisting of an incinerator, a vent gas burner, a furnace, a steam turbine and combinations thereof.

Claim 19. (Original) The method of claim 1, wherein providing the catalyst mixture further comprises providing the catalyst mixture having a pH of less than about 4.0.

Claim 20. (Original) The method of claim 19, wherein providing the catalyst mixture further comprises providing the catalyst mixture having a pH of between about 1.4 and about 3.0.

Claim 21. (Original) The method of claim 20, wherein providing the catalyst mixture further comprises providing the catalyst mixture having a pH of between about 1.6 and about 2.2.

Claim 22. (Original) The method of claim 1, wherein the catalyst mixture comprises a concentration of Pt, as $H_2PtCl_6 \cdot 6H_2O$ at least about 0.28 mg/ml, a concentration of Rh, as $RhCl_3$ at least about 0.07 mg/ml, a concentration of Re, as perrhenic acid at least about 0.1 mg/ml, and a concentration of Al, as $AlCl_3$, at least about 0.07 mg/ml.

Claim 23. (Original) The method of claim 1, wherein the catalyst mixture comprises a concentration of Pt, as $H_2PtCl_6 \cdot 6H_2O$ at least about 0.28 mg/ml, a concentration of Rh, as $RhCl_3$ at least about 0.07 mg/ml, a concentration of Re, as perrhenic acid at least about 0.1 mg/ml, and a concentration of Mg as $MgCl_2$, at least about 0.07 mg/ml.

Claim 24. (Original) The method of claim 1, wherein the catalyst mixture further comprises a surfactant.

Claim 25. (Original) The method of claim 2, wherein the liquid further comprises a surfactant.

Claim 26. (Original) The method of claim 1, wherein mixing a portion of the catalyst with the combustion air comprises transporting the catalyst particles to a combustion air intake to the flame zone and mixing the catalyst with the combustion air within the air intake.

Claim 27. (Original) The method of claim 1, wherein a ratio of Pt to Rh in the mixture is between about 15 to 1 and about 4 to 1, a ratio of Pt to Re in the mixture is between about 15 to 1 and about 2 to 1, and a ratio of Pt to Al in the mixture is between about 15 to 1 and about 2 to 1.

Claim 28. (Original) The method of claim 24, wherein the ratio of Pt to Rh in the mixture is about 8.6 to 1, the ratio of Pt to Re in the mixture is about 6 to 1, and the ratio of Pt to Al in the mixture is about 8.6 to 1.

Claim 29. (Original) A catalyst mixture for use in the generation of fluidized catalyst particles for fuel oxidation, the catalyst mixture comprising:

at least one compound having at least one element selected from the group consisting of group III, group IIA and Lanthanide group; and

at least one compound having at least one element selected from the group consisting of group IA, group IVA, group VI, group VII, group VIII, group IB, group IIB and combinations thereof.

Claim 30. (Original) The catalyst mixture of claim 29, wherein the catalyst mixture comprises a concentration of Pt, as $H_2PtCl_6 \cdot 6H_2O$ at least about 0.28 mg/ml, a concentration of Rh, as $RhCl_3$ at least about 0.07 mg/ml, a concentration of Re, as perrhenic acid at least about 0.1 mg/ml, and a concentration of Al, as $AlCl_3$ at least about 0.07 mg/ml.

Claim 31. (Original) The catalyst mixture of claim 29, wherein the catalyst mixture comprises a concentration of Pt, as $H_2PtCl_6 \cdot 6H_2O$ at least about 0.28 mg/ml, a concentration of Rh, as $RhCl_3$ at least about 0.07 mg/ml, a concentration of Re, as perrhenic acid at least about 0.1 mg/ml, and a concentration of Mg as $MgCl_2$ at least about 0.07 mg/ml.

Claim 32. (Original) The catalyst mixture of claim 29, wherein the catalyst mixture further comprises aqueous acid, wherein the catalyst mixture in aqueous acid has a pH of less than about 4.0.

Claim 33. (Original) The catalyst mixture of claim 32, wherein the aqueous acid is aqueous hydrochloric acid.

Claim 34. (Original) The catalyst mixture of claim 29, wherein the catalyst mixture in aqueous acid has a pH of between about 1.4 and about 3.0.

Claim 35. (Original) The catalyst mixture of claim 29, wherein the catalyst mixture in aqueous acid has a pH of between about 1.6 and about 2.2.

Claim 36. (Original) The catalyst mixture of claim 29, further comprising a liquid comprising substantially equal parts of ethylene glycol and water.

Claim 37. (Original) The catalyst mixture of claim 35, further comprising one or more of LiCl, NaCl, and HCl.

Claim 38. (Original) The catalyst mixture of claim 29, wherein the catalyst mixture further comprises a surfactant selected from the group consisting of ethylene glycol, propylene glycol, methanol, ethanol, propanol, butanol, pentanol, hexanol, isopropyl alcohol, isobutyl alcohol, silicone oil, and combinations thereof.

Claim 39. (Original) The catalyst mixture of claim 29, wherein a ratio of Pt to Rh in the mixture is between about 15 to 1 and about 4 to 1, a ratio of Pt to Re in the mixture is between about 15 to 1 and about 2 to 1, and a ratio of Pt to Al in the mixture is between about 15 to 1 and about 2 to 1.

Claim 40. (Original) The catalyst mixture of claim 39, wherein the ratio of Pt to Rh in the mixture is about 8.6 to 1, the ratio of Pt to Re in the mixture is about 6 to 1, and the ratio of Pt to Al in the mixture is about 8.6 to 1.



Claim 41. (Original) A fuel oxidation system comprising:

a flame zone for oxidizing fuel;

a catalyst chamber having a catalyst mixture therein, the catalyst mixture comprising:

at least one compound having at least one element selected from the group consisting of group III and group IIA; and

at least one compound having at least one element selected from the group consisting of group IA, group IVA, group VI, group VII, group VIII, group IB, group II and combinations thereof; and

a catalyst transport configured to transport catalyst particles from the catalyst chamber to the flame zone.

Claim 42. (Original) The system of claim 41, wherein the flame zone is that of an open flame.

Claim 43. (Original) The system of claim 41, wherein the flame zone is that of an enclosed flame.

Claim 44. (Original) The system of claim 41, wherein the system is configured to oxidize a fuel selected from the group consisting of gasoline and diesel fuel.

Claim 45. (Original) The system of claim 41, wherein the system is configured to oxidize a fuel selected from the group consisting of number 2 fuel oil, fuel oil refined from crude oil, diesel fuel, gasoline, compressed or liquified natural gas, gasohol, any hydrocarbon having one or more carbon atoms such as methane, ethane, propane, butane, isobutane, toluene, xylene, octane, benzene, mixtures of alcohols having methanol, ethanol, propanol, butanol, isopropanol, isobutanol, pentanol, hexanol, heptanol, octanol and combinations thereof, vegetable oil such as corn oil, mineral oil, coal, coal gas, asphalt vapor, oxidizable vapors from chemical processes, wood, paper and combinations thereof.

Claim 46. (Original) The system of claim 41, wherein the flame zone is a combustion chamber of a reciprocating engine selected from the group consisting of a gasoline fuel engine and a diesel fuel engine.

Claim 47. (Original) The system of claim 41, wherein the flame zone is a combustion chamber of a reciprocating engine configured to oxidize a fuel is selected from the group consisting of number 2 fuel oil, fuel oil refined from crude oil, diesel fuel, gasoline, compressed or liquified natural gas, gasohol, any hydrocarbon having one or more carbon atoms such as methane, ethane, propane, butane, isobutane, toluene, xylene, octane, benzene, mixtures of alcohols having methanol, ethanol, propanol, butanol, isopropanol, isobutanol, pentanol, hexanol, heptanol, octanol and combinations thereof, vegetable oil such as corn oil, mineral oil, coal, coal gas, asphalt vapor, oxidizable vapors from chemical processes, wood, paper and combinations thereof.

Claim 48. (Original) The system of claim 41, wherein oxidizing the fuel comprises oxidizing within a flame zone of an appratus selected from the group consisting of a furnace, a boiler and an incinerator.

Claim 50 49. (Currently Amended) A method of oxidizing fuel, the method comprising: sparging a gas through a catalyst mixture comprising at least one Platinum compound and at least one compound containing at least one of Aluminum and Magnesium; mixing catalyst mixture particles with combustion air prior to adding fuel; and oxidizing fuel in the presence of the catalyst-containing combustion air.

B1
Claim 51 50. (Currently Amended) The method of claim 50 49, wherein the sparging gas is selected from the group consisting of helium, argon, nitrogen, air and combinations thereof.

Claim 52 51. (Currently Amended) The method of claim 50 49, further comprising ionizing the sparging gas prior to sparging it through the catalyst mixture.

Claim 53 52. (Currently Amended) The method of claim 50 49, further comprising transporting the particles to a flame zone under negative pressure.

Claim 54 53. (Currently Amended) The method of claim 50 49, further comprising establishing a catalyst mixture having a pH of less than about 4.0 prior to sparging the gas through the catalyst mixture.

Claim 55 54. (Currently Amended) The method of claim 50 49, further comprising establishing a catalyst mixture having a pH of between about 1.4 and about 3.0 prior to sparging the gas through the catalyst mixture.

Claim 56 55. (Currently Amended) A catalyst mixture for oxidation of a fuel, the catalyst mixture comprising:

about 0.2-4 mg/ml of $H_2PtCl_6 \cdot 6H_2O$;
about 0.28 mg/ml of $RhCl_3$;
about 0.4 mg/ml of $HReO_4$; and
between about 0.28 mg/ml and about 0.56 mg/ml of at least one of $AlCl_3$ and $MgCl_2$.

Claim 57 56. (Currently Amended) The catalyst mixture of claim 56 55, wherein a ratio of Pt to Rh in the mixture is between about 15 to 1 and about 4 to 1, a ratio of Pt to Re in the mixture is between about 15 to 1 and about 2 to 1, and a ratio of Pt to Al or Mg in the mixture is between about 15 to 1 and about 2 to 1.

Claim 58 57. (Currently Amended) The catalyst mixture of claim 57 56, wherein the ratio of Pt to Rh in the mixture is about 8.6 to 1, the ratio of Pt to Re in the mixture is about 6 to 1, and the ratio of Pt to Al or Mg in the mixture is about 8.6 to 1.

Claim 59 58. (Currently Amended) The catalyst mixture of claim 56 55, wherein the total volume of the catalyst mixture is about 650 ml.

Claim 53 59. (Currently Amended) The catalyst mixture of claim 51 55, the liquid mixture further comprising one or more of HCl, NaCl, and LiCl.

Claim 54 60. (Currently Amended) The catalyst mixture of claim 53 59, wherein the liquid mixture comprises approximately 5400 ppm of LiCl by weight.

Claim 55 61. (Currently Amended) The catalyst mixture of claim 49, further comprising hydrochloric acid.

Claim 56 62. (Currently Amended) The catalyst mixture of claim 49, wherein the catalyst mixture has a pH of less than about 4.0.

Claim 57 63. (Currently Amended) The catalyst mixture of claim 49, wherein the catalyst mixture has a pH of between about 1.2 and about 4.0.

Claim 58 64. (Currently Amended) The catalyst mixture of claim 49, wherein the catalyst mixture has a pH of between about 1.4 and about 3.0.

Claim 59 65. (Currently Amended) The catalyst mixture of claim 49, wherein the catalyst mixture has a pH of between about 1.6 and about 2.2.

Claim 60 66. (Currently Amended) The catalyst mixture of claim 49, wherein the catalyst mixture further comprises a surfactant selected from the group consisting of ethylene glycol, propylene glycol, methanol, ethanol, propanol, butanol, pentanol, hexanol, isopropyl alcohol, isobutyl alcohol, silicone oil, and combinations thereof.